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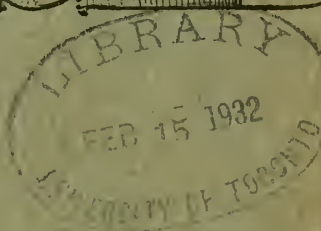
THE OSPREY

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of BIRDS & NATURE



Complete Series,

Volume VI.



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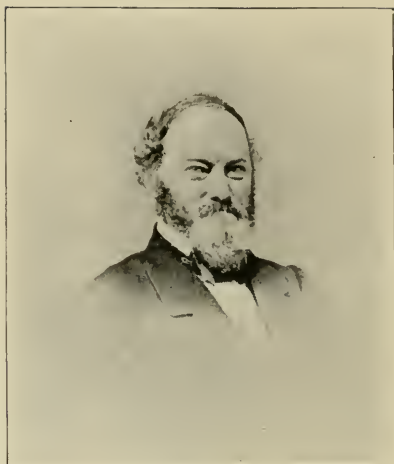
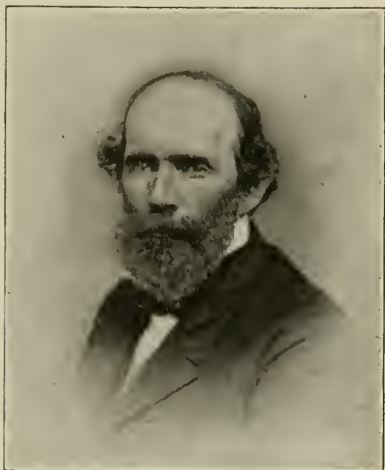
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THE OSPREY.

An Illustrated Magazine of Popular Ornithology.

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NUMBER 4.

THE FEEDING HABITS OF THE COOT AND OTHER WATER BIRDS.

By BARTON WARREN EVERMANN.

During the last two years, while engaged in a biological survey of Lake Maxinkuckee, Indiana, I had opportunity to make some observations upon the water birds which visit that lake, and it is concerning some of these that I wish to speak in this paper.

The species of water birds observed there are as follows:

1. Horned Grebe (*Colymbus auritus*).
2. Hell-diver (*Podilymbus podiceps*).
3. Common Loon (*Gavia imber*).
4. Fish Duck (*Merganser americanus*).
5. Red-breasted Merganser (*M. serrator*).
6. Hooded Merganser (*Lophodytes cucullatus*).
7. Mallard (*Anas boschas*).
8. Black Mallard (*A. obscurus*).
9. Blue-wing Teal (*Querquedula discors*).
10. Green-winged Teal (*Nettion carolinense*).
11. Gadwall (*Chaulelasmus streperus*).
12. American Widgeon (*Mareca americana*).
13. Shoveller (*Spatula clypeata*).
14. Pin-tail (*Dafila acuta*).
15. Wood Duck (*Aix sponsa*).
16. Redhead (*Aythya americana*).
17. Canvas-back Duck (*A. vallisneria*).
18. Bluebill (*A. marila*).
19. Little Bluebill (*A. affinis*).

20. Ring-necked Duck (*A. collaris*).
21. Whistler (*Clangula clangula americana*).
22. Butterball (*Charitonetta albeola*).
23. Old Squaw (*Harelda hyemalis*).
24. Ruddy Duck (*Erismatura jamaicensis*).
25. Wild Goose (*Branta canadensis*).
26. Swan (*Olor buccinator*).
27. Coot (*Fulica americana*).

The most abundant of all of these is the coot, followed by the bluebill, little bluebill, redhead, butterball, mallard, canvas-back, whistler and ruddy duck. The first to arrive in the fall are the coots and then a few helldivers and horned grebes appear. Then the two species of bluebill, the mallard, the whistlers and the ruddy ducks come; and still later the redheads and canvas-backs, and the fish-ducks.

Early in September the coots came in great numbers, and were very soon found in all parts of the lake. A few were seen in August, but the first large lot came on September 22 in 1899, and also in 1900. That portion of the lake immediately in front of my cottage was one of their favorite feeding grounds, and I had exceptionally good opportunities for observing them daily, or even hourly, from the time they came up to October 18, in 1899, and up to December 11, of 1900.

During my observations in 1899, it had not occurred to me that anything new or of importance could be learned regarding the habits of this well-known bird, and the observations we recorded were made and recorded chiefly and simply as a matter of personal pleasure and knowledge. But when I returned home in the fall and began looking through various ornithological works to see how my observations tallied with those of others, I was surprised to find, in the first place, how little has really been recorded, and in the second place, that much that has been recorded does not agree at all with my own observations.

I became particularly interested in what was said in the books regarding the flying, diving and feeding of the coot, and the character of its flesh as an article of food.

According to Giraud, as quoted by Baird, Brewer and Ridgway, "if pursued the coot can run very fast and swim and dive very well; and, if in danger, with great rapidity". Dr. Cooper says, "Being but rarely shot at by hunters, it is remarkably tame, collecting in flocks of hundreds in the marshes about San Francisco and other cities, as well as near remote mountain lakes, walking awkwardly about on their shores, and scarcely getting out of the way to escape the sportsman, who thinks it an unworthy object of his skill, as its flesh is dark and unpalatable. The young bird, however, is said to be good eating".

In other places he says, "The coot can swim and dive with great ease". "In such situations it spends most of its time feeding on grasshoppers, leaves of aquatic plants, small shells, and insects, collecting much of its food under water".

Mr. Moore, who observed this bird in Florida, states that Audubon was in error in supposing that it never dives. He says it is not in the habit of immersing its entire body, yet he has occasionally seen one or two birds in a squad of four or five plunge and remain so long beneath the surface that this had become smooth before they emerged. "This is frequently done by one individual while the others by its side are engaged in picking from the surface".

John Bartram, in a letter to Alexander Wilson, says, "It swims remarkably well, and when wounded will dive like a duck. They are loquacious and noisy, talking to one another night and day, and constantly on the water, the broad lobated membranes on their toes enabling them to swim and dive like ducks". Wilson further says that "Buffon describes the mode of shooting coots in France, particularly in Lorraine, on the great pools of Tiancourt and of Indre; hence we are led to suppose that they are esteemed as an article of food. But with us who are enabled by the abundance and variety of game to indulge in greater luxuries in that season when our coots visit us, they are considered as of no account, and are seldom eaten".

Dr. Coues says, "I do not recollect when, if ever, I have seen coots fly up into the air and away. * * * As an article of food they may take fair rank, though they are considered on the whole as inferior to most ducks". He says nothing about their food or their diving.

Maynard says, "they not only swim and dive well, but make their way through the grass with ease and swiftness". Wheaton says, "It is more aquatic in its habits than the others of its family, being better adapted for swimming and diving than for locomotion on land. They are considered a nuisance by sportsmen and a fraud by amateurs, who sometimes mistake them for ducks".

Nuttall says, "They are nocturnal in their habits, the old birds being rarely seen by day. * * * With us they are very taciturn, though tame, and appear to have no voice but for the exciting period of the nuptial season. * * * They swim and dive with the utmost facility. * * * They are habitual divers. * * * They do not appear to dive with the same promptness as the European species".

At Lake Maxinkuckee the coot is as thoroughly a water bird as any species of duck. I never saw them walking on shore as mentioned by Cooper, but observed that they might be found in any and all parts of the lake, though they were more apt to occur in larger numbers nearer shore than most other species. I think the helldivers and horned grebes came, as a rule, somewhat

nearer shore than the coots; and small flocks of butterballs and whistlers and solitary ruddy ducks were also disposed to stay quite near shore. Bluebills (both large and small) would usually be a little further from shore than the coots, while the redheads, mallards and canvas-backs would be still further out. However, it often happened that nearly or quite all of these species would be mixed together in a single flock, the coots and bluebills constituting the shore side of the miscellaneous group.

When the coots first arrived in numbers in the fall, they were not wild and came nearer shore than they did later, after they had been hunted. One of their favorite feeding grounds was in front of my cottage, where, if not disturbed, they remained day and night; and as we were careful to disturb them as little as possible, they were usually there in considerable numbers until that part of the lake froze over, which occurred about the middle of December. They never left except when disturbed by some one, or when that part of the lake was made rough by winds, when they would fly to some protected corner of the lake.

The depth of the water in this locality varied from four to twenty-five feet, and the bottom everywhere was well covered with various species of *Potamogeton*, *Myriophyllum*, *Tolypella*, *Vallisneria*, and perhaps others. The *Chara* and *Nitella* grew in the more shallow water, and *Tolypella* in the deepest, while the tape-grass or wild celery (*Vallisneria spiralis*) grew at all depths from four up to twenty-two feet.

There is, of course, no question about the coot's ability to swim well. This they do quite as well and as gracefully as most ducks. They are also very noisy, keeping up their calls and conversations during all hours of the day and night. And, contrary to some observers, it is a very expert diver. Not only will it dive when wounded, to get away from its pursuer, but it dives regularly and habitually while feeding, and with the greatest ease and grace.

Watching them from the cottage piazza with a good pair of field-glasses was an extremely fascinating pastime. They always fed most industriously when the surface of the water was smooth and when the air was balmy. They also fed actively on calm, moonlit nights.

I soon discovered that they were feeding upon the wild celery, but was at first not sure what part of the plant they ate. I had read in the botanies and the ornithologies that the great delicacy of the flesh of the canvas-back duck is due to its feeding upon "the roots" or the "leaves" of the wild celery. If a brisk breeze should spring up after the coots had been feeding diligently for a few hours or a day or two, a great quantity of wild celery plants would be washed up on the lee shore. Upon examining these plants, I was not able to discover that the roots or leaves of many of them had been removed.

Nearly all of the plants seemed intact and perfect so far as these parts were concerned. But one interesting and curious part of the plant I was never able to find on any of the plants washed up on the shore. This is the modified stolon or so-called winter bud, which many, perhaps all, of the *Vallisneria* plants form in the late summer. This is a short stem about the size of a lead pencil, one-half to two inches long, somewhat enlarged at the distal end, white in color, very crisp and tender, and with quite a pleasant taste.

We soon found that it was upon these winter buds that the coots were feeding, apparently exclusively, and I have no doubt that during the early fall they constitute the principal food of the coots that frequent this lake.

Later in the fall, after the supply of winter buds became practically exhausted, the coots, bluebills, redheads and canvas-backs began eating the bases of the wild celery leaves, and apparently, as choice food became more and more scarce, they fed upon parts of this plant and upon other plants which they at first rejected.

The depth of water in which they obtained the wild celery varied from four to twenty-two feet. Early in the season they were disposed to feed in the more shallow water, but later they went to greater depths. So far as we were able to observe, every patch of wild celery in the lake became a feeding ground.

The coot dives with greater abruptness than any duck I have observed. The body turns very quickly and is usually in nearly a vertical position before entirely submerged. There is of course great irregularity in the frequency of their diving. The character of the weather, whether they are disturbed or not, the success of their dives, and the extent of their hunger, are factors determining the frequency. But ordinarily one dive follows another very quickly, so that, when watching a flock of a dozen or more, one or more individuals can be seen going under and one or more emerging at any moment.

Depth: The maximum depth to which coots can descend I do not know, but I do know they reach bottom in at least twenty-five feet. In front of our cottage we had a buoy marking a twenty-five foot hole, and I have often seen coots close to this buoy, diving and bringing up food from the bottom. Usually, however, their choice feeding grounds are in depths between four and eighteen feet.

Time remaining under water: The length of time the coots would remain under water varied a great deal, it probably being determined chiefly by the depth to which they had to go and the readiness with which acceptable food could be found. The longest time any individual was observed to remain under water was sixteen seconds, and the usual time in water four to ten feet deep was about nine seconds.

Lake freezing over: About the middle of December the lake began to

freeze over, and by the first of January only one or two open spaces or holes were left. On the 2nd of January my assistant, Mr. H. Walton Clark, who remained at the lake all winter, and who is the best field naturalist I ever knew, went out on the ice to the largest of those open spaces, which he found pretty well filled with coots and ducks, and a good many sitting on the ice at the edge of the pool. Upon firing among them, instead of rising and flying away, they attempted to get away by running on the ice. This they could not do very well, so he ran in among them and caught with his hands 3 canvas-back ducks, 1 ruddy duck and 1 coot.

There was no wind and the ice was very smooth, conditions which, Mr. Clark thinks, made it difficult for the birds to rise.

I can easily believe this to be true for I have seen a duck, which was merely able to walk slowly while on the ice, rise and fly when it reached the shore, where its feet would not slip. When the ice is very smooth, the ducks slide along in a most ludicrous and helpless manner. It had become suddenly very cold the preceding night, and these birds, sitting on the ice for some hours, had doubtless become benumbed and inactive, and this is probably one reason why they were not able to rise promptly when first disturbed.

Mr. Clark states that the coot was the best runner on the ice, and that the canvas-backs were the poorest. The little ruddy duck proved a great scrapper. When he found he could not get away, he turned and charged Mr. Clark with open mouth and most savagely.

Later the same day Mr. Clark visited another open pool, perhaps ten to twenty feet in diameter, which he found filled with coots and several species of ducks, among which were one wood duck, several mallards, one ruddy duck, several butterballs, one merganser, and three canvas-backs. On the ice near the pool were a great many ducks which arose and flew away upon his approach. Those in the pool were slower to leave, but as he came nearer, the butterballs rose first, then the coots got out upon the ice and scrambled away. The canvas-backs remained in the pool longest of any, and Mr. Clark is of the opinion that this species stands the poorest chance when the waters tighten up.

The next day (January 3) Mr. Clark visited the larger pool again; and that he might get as close as possible to the coots and ducks without frightening them, he wrapped himself in a white sheet. Lying down upon the ice, he was able to crawl to within two feet of the water's edge without scaring the birds away. There were in the pool three canvas-backs, three little bluebills, one ruddy duck, and four coots, and Mr. Clark lay there on the ice during most of the afternoon watching them. He remarks in his letter to me that he is not sure what effect this will have upon his health, but he never did anything in his life more interesting! He says, "The birds, especially the coots, were

very busy diving and feeding. The ducks were not so active. It was both amusing and instructive to watch them. They were not usually more than eight to twelve feet from me, and I could plainly see the eyes of every one of them, and the little bluebill came so close I could see the pupil of his eye. I could see them close and open their eyes, which every one did frequently. The little bluebill was a very active and persistent diver. He seemed to be feeding upon shells, as he never brought up anything bulky and he would do a lot of vigorous chewing, and I could hear a crunching noise like shells being broken up when he chewed. The coots came so near I could see the black spots on their bills and their red eyes.

“While lying at this pool, several other ducks, chiefly mallards and whistlers, came and either alighted in the pool or circled about and left. The whistlers dived very often, easily and rapidly, while the canvas-backs dived but rarely and very clumsily at that. One or more of the coots were down nearly all the time. They go down with a vim. Generally, when one dived, the other three stayed up and watched for his coming up. They were able to see him some moments before he reappeared and, hurrying to the spot where they thought he would emerge, would be on hand ready to appropriate for themselves as much of the food brought up as they could get possession of. Not only would the coots thus rob each other, but the ducks also robbed them. Whenever a coot came up with an unusually great load, the little bluebills and even the canvas-back drake would be on hand to help themselves. In this way the coots feed not only each other but various ducks as well; but it was observed that the ducks do very little robbing from each other”.

Food: Usually a considerable mass of vegetation was brought up each time. In this particular place the principal food seemed to be one or more species of *Potamogeton*, *P. pectinatus* probably predominating. They often come up with the long stems hanging over their backs. Quite often the plant brought up looks like *Chara*, but of this I could not be sure.

It is quite certain the plants they were getting here were not their favorite food, but such as they could utilize when necessary.

Depth: Soundings taken in this pool show that the depth was nine to twelve feet. This open pool was not in the part of the lake which one would expect to remain open longest, and Mr. Clark suggests the coots and ducks determine the location of the open pools. As the ice-sheet spreads out more and more from shore, it travels very rapidly, once the water has become thoroughly chilled and the air cold and still. A number of birds feeding in any particular place, or merely resting on the water, would keep the water more or less disturbed, and the heat of their bodies would certainly raise the temperature of the water slightly, at least, and freezing at this place would

be prevented. As the rest of the lake closed up, more fowls would come to this open place, and its freezing would be still longer delayed.

This theory seems entirely reasonable to me. Mr. Clark visited this open pool late at night, remaining until after ten o'clock, to see how the birds behaved then. He found the open place literally packed full of birds, and a great many more sitting on the ice near the pool.

Mr. Clark reports seeing no coots after January 10, and no ducks after February 7.

The coot as an article of food: I have been very much interested in the coot as an article of food. The opinion of those who have put themselves on record in the books is almost unanimous that the coot is worthless as food. And inquiry among my ornithological friends here in Washington resulted in my finding only two or three who had ever tasted coot. The majority of them seemed to regard eating coot very much as we regard eating crow,—a thing not to be thought of!

But my friends Dr. Fisher and Mr. William Palmer admit that they have eaten coot and like it. They even say they regard coot as not at all inferior to the famous canvas-back duck, and in this I agree with them fully. Coot, particularly young ones, skinned and fried, or even old ones parboiled, then baked, are quite as delicious as any duck I ever ate.

It is, however, doubtless true that the delicacy of flavor, not only of the coot, but also of the canvas-back and all other ducks, is largely determined by the kinds of food they get. The wild celery (*Vallisneria spiralis*) is sufficiently abundant in Lake Maxinkuckee to give to the coot frequenting that lake a delicate flavor which has received high praise from all who are familiar with it.

Summing up, then, my observations concerning the coot as seen at Lake Maxinkuckee, I would say that

1. It is quite as aquatic in its habits as most ducks.
2. It is a splendid diver, and dives regularly and habitually when feeding.
3. It feeds preferably upon the winter stolons of the wild celery, but later upon other parts of that plant and upon various species of *Potamogeton*, for which it dives as deep as twenty-five feet.
4. As an article of food, the coot is superior to most species of ducks.
5. When feeding it is not the taciturn bird Nuttall would have us believe, but a very sociable, loquacious bird, constantly talking to its associates day and night.
6. It is nocturnal in its habits to some extent but perhaps not any more so than the mallard, the bluebill and some other ducks.

THE BIRDS OF THE MARIANNE ISLANDS AND THEIR
VERNACULAR NAMES.—I.

By W. E. SAFFORD.

Continued from page 42.

For example Umátag, the village off which the Uranie anchored, is written "Humata." Moreover the Spanish represent the sound of the English *j* or *dg* in judge by the letter *y*, writing the name of the frigate bird, for instance, "payāya," when it is really pronounced padjaádja.

The sounds of the words in the Chamorro language, as the vernacular of the Marianna Islanders is called, may be represented by the following letters.

ALPHABET OF THE CHAMORRO LANGUAGE.

- a*, as in *far, father*; German *haben*; Spanish *ramo*.
ä, as in *hat, man*.
ai, as in *aisle*, as *i* in *pine*; German *Hain*; Spanish *ay!*
au, as *ou* in *out*; German *Haus*; Spanish *causa*.
b, as in *box*; German *Buch*; Spanish *bajo*.
ch, as in *church*; Spanish *mucho*.
d, as in *dead*; German *das*; Spanish *de*.
e, as in *they*; German *leben*; Spanish *qué*.
f, as in *fife*; German *Feur*; Spanish *fumar*.
g, as in *get*; German *geben*; Spanish *ganar*.
h, as in *he*; German *haben*; when final, like the German *ch* in *Dach*.
i, as in *machine*; German *ihn* Spanish *hilo*.
j, as in *judge*, as *g* in *gentle*; Italian *Giovanni*.
k, as in *kick*; French *qu* in *qui*; Spanish *qu* in *quebrar*.
l, as in *lull*; German *lassen*; Spanish *lástima*.
m, as in *mum*; German *Mutter*; Spanish *madre*.
n, as in *nun*; German *nur*; Spanish *nación*.
ng, as in *finger, linger*.
ñg, as in *sing, singer*; German *Hunger, länger*.
ñ, as *ni* in *companion*; Spanish *cañon*; French *gn* in *agneau*.
o, as in *note*; German *Ofen*; French *nos*; Spanish *nosotros*.
p, as in *pipe*; German *Puppe*; Spanish *padre*.
r, as in *rural*; German *rund*; Spanish *ramo*.
s, as in *see*; German *besser*; Spanish *saco*.
t, as in *touch*; German *Tag*; Spanish *tocar*.
u, as a *rule*; German *du*; Spanish *uno*; French *ou* in *douce*.

NOTE.—In words derived from the Spanish soft *c* and *z* are replaced by

s; hard *c* and *qu* by *k*; *j* by *h*; final *l* and *r* by *t*, as *Kolonet* from *Colonel*, *Señot* from *Señor*; *r* frequently by *l*, as *kolales* from *corales*, *kolat* from *corral* (enclosure); *ll* and *y* by *j*, as *boteja* from *botella*; *v* by *b*, as *baka* from *vaca*; and *x* by *ks*, as *eksamen* from *examen*.

Modification of Vowels.—*A*, *o*, and *u*, occurring in the first syllable of a word and bearing the stress, or tonic emphasis or accent, are modified to *ä*, *e*, and *i* respectively when the word is preceded by the definite article. Thus we have *äga*, crow, *i äga*, the crow; *chótä*, banana-plant, *i chétä*, the banana plant; *güma* house, *i gima*, the house. That the Spanish and French systems of orthography are especially inappropriate for the Chamorro language is evident when we note that, if they be followed, “fence” would be *colat*; “the fence” would be *i quelat*, while the letter *u* would have to follow *g* to keep it hard before *e* and *i*, as *i guüma*, the house.

Guttural Vowels.—Vowels with a circumflex accent (ˆ) have a guttural quality, as in *kókó*, rail; *chuchúgú*, reef heron.

VERNACULAR NAMES OF MARIANNE BIRDS.

Anous leucocapillus Gould. BLACK-CHEEKED NODDY.

Local name.—*Fáhan*. Not uncommon.

Anous stolidus (Linn.). NODDY.

Local name.—*Fáhan*. Not uncommon.

Gygis alba kittlitzi Hartert. WHITE TERN.

Local name.—*Chún̄gi*, *Chún̄ge*. Common. Frequents trees of the forest; does not build a nest; lays a single egg on the bare limb of a tree. This species is also common in Pangopango Bay, Samoa.

Sula sula Linn. COMMON BOOBY.

Local name.—*Lúau*. Common off Orote peninsula on the coast of Guam; pursues flying-fish; darts into water from a great height.

Fregata aquila var. *minor*. FRIGATE BIRD.

Local name.—*Padjaúdja*. Not rare, but seldom seen near the shore; never dives; picks up its food by a downward and backward motion of its hooked beak.

Anas oustaleti Salvadori. MARIANNE DUCK.

Local name.—*Ŋgaínga* or *Ŋgaínga-pálan*. Common in marshes; much hunted by natives; excellent for food. Several killed by Lieutenant Carpenter were served at the mess; flavor delicious. It resembles *Anas superciliaris* of Samoa.

Ardetta bryani Seale. MARIANNE BITTERN.

Local name.—*Kákkak* or *Kákkag*. Common near streams and damp

places inland, as well as near shore; often seen flying over the plaza of Agaña.

Demigretta sacra (Gm.). REEF HERON.

Local names.—*Chúchukô*, *Chíchukô* (Chamorro); *Garza* (Spanish).

Not rare, but wary and hard to approach.

Hypotenidia owstoni Rothschild. MARIANNE RAIL.

Local name.—*Kôkô*. Not scarce, but very shy, concealing itself in the reeds and high grass of the marshes. Natives catch it by means of snares laid in the paths. Good to eat. Very much like the Samoan *Ve'a*.

Poliolimnas cinereus Vieill. GRAY RAIL.

Local name.—*Kôkô dikiki*. Smaller than the preceding; very shy. Native name signifies "Little Rail". Name given by Japanese (*Galan-gajiô*) signifies "look like a cock",—*kalan gallo*.

Gallinula chloropus Lath. GALLINULE.

Local name.—*Pulátal* or *Pulátat*. Common. Specimens kept in captivity most active at night. Excellent food. A beautiful scarlet frontal shield, like the Samoan *Manu-a-lî*.

Gallinago megala Swinh. SNIPE.

The natives did not seem decided as to the name of this bird, several specimens of which were killed by Lieutenant Carpenter during the winter months. Some called it *Dulîli*, the name applied generally to plovers and sandpipers, while others said it was a *Kalálan dikiki*, or little curlew.

Limosa lapponica baueri (Naum.). PACIFIC GODWIT.

Local name.—*Kalálan*, the same as that applied to the Curlews. I did not see this bird, but the natives said they were sometimes seen Kalálan with *tunas*, or straight, beaks. Occurs also in Samoa.

Numenius cyanopus Vieill. AUSTRALIAN CURLEW.

Common name.—*Kalálan*. Not uncommon; several visited the plaza of Agaña daily after it had been newly cleared. Often seen on cultivated fields in the interior.

Numenius phaeopus variegatus Scop. ORIENTAL WHIMBREL.

Common name.—*Kalálan*. Not uncommon during times of migration. Much smaller than the preceding.

Heteractitis brevipes Vieill. ASIATIC WANDERING TATTLER.

Common name.—*Dulîli*. A pretty sandpiper, gray above and white below; also occurs in Samoa. Mr. Seale shot several in June and July.

Charadrius squatarola (Linn.). BLACK-BELLIED PLOVER; BULL-HEAD.

Common name.—*Dulîli*. Lieutenant Carpenter shot several during the winter. He called them Bull-heads.

Charadrius fulvus Gm. ASIATIC GOLDEN PLOVER.

Common name.—*Dulili*. This is the commonest of shore birds. It is often seen on cultivated fields inland. A number were shot by Lieutenant Carpenter during the winter months in company with the preceding species and with turn-stones. Occurs also in Samoa.

Charadrius mongolicus Pall. MONGOLIAN SAND DOTTEREL.

Common name.—*Dulili*. I saw a single specimen, a female, shot by Mr. Seale.

Arenaria interpres (Linn.). TURNSTONE.

Common name.—*Dulili*. Not rare; can be recognized by its bright orange-yellow legs. One of the shore birds of Samoa.

Excalfactoria sinensis (Gm.). PIGMY QUAIL.

Common name.—*Bīngbiñg* or *Beñgbeñg*. Introduced; now spread over the island of Guam. The vernacular name is given it as descriptive of the noise made by its wings in flying.

Megapodius laperousi Quoy and Gaimard. MARIANNE MEGAPODE.

Local names.—*Sāsseñgat* (Chamorro); *Pollo del Monte* (Spanish). Common on the island of Tinian; but I do not think it occurs in Guam. The natives attract it by knocking stones together.

Ptilinopus roseicapillus (Less.) ROSE-CROWNED FRUIT-PIGEON.

Local name.—*Totot* or *Tottot*. A beautiful bird resembling the *Manu-tangi* of Samoa (*Pt. fasciatus*), having a rose-purple crown. I kept four of them in captivity, feeding them the fruit of *Triphasia aurantiola*, *Cananga odorata* and *Cestrum*.

Phlegænas xanthonura (Temm.). WHITE-HEADED PIGEON.

Local names.—Male: *Apáka*, *Paloman apáka*. Female: *Paloman kúnao*. They feed on the fruit of *Triphasia aurantiola*, *Cananga odorata*, and a species of *Cestrum*, called *Tintan-china*. The natives think the sexes are distinct species which live together.

Turtur dussumieri (Temm.). WILD PIGEON.

Local name.—*Paloman halom-tano*. "Halom-tano" signifies "inland", or "wild", to distinguish an animal or plant from one living in domestication or on the strand. Common in the fields.

Asio accipitrinus (Pall.). SHORT-EARED OWL.

Local name.—*Mómo*, *Moñgmo*, *Móngo* (Chamorro); *Lechuza* (Spanish). This bird does not occur on Guam; but it does belong to the Marianne fauna. The natives describe it with sufficient accuracy to determine it.

Halcyon cinnamominus Swains. GUAM KINGFISHER.

Local names.—*Sihig*, *Sihig* (Chamorro); *Carpintero* (Spanish). Does not catch fish, but feeds on lizards and insects, like the allied *Tio-talas* of Samoa.

Collocalia fuciphaga (Thunb.). EDIBLE-NEST SWIFT.

Local names.—*Jujáguag* (Chamorro); *Golondrina* (Spanish). In the Marinnés the nests are matted with leaves stuck together with saliva, and are very different from the typical nests so much esteemed for food by the Chinese. Common. Closely resembles the Pe'ape'a of Samoa.

Rhipidura uraniae Oustalet. FAN-TAILED FLY-CATCHER.

Local names.—*Chichirika*, *Chichirita*. A pretty bird which follows one along the road, spreading its tail, as though wishing to attract notice, like the Samoan *Se'u*.

Myiagra freycineti Oustalet. DEFREYCINET'S FLY-CATCHER.

Local names.—*Chiguánguan*, *Chuguánguan*. This little bird frequents shady woods, feeding on insects which it catches on the wing with an audible snap of its bill; like the Samoan *Tolai*.

Acrocephalus lusciniæ (Quoy and Gaimard). REED WARBLER.

Local names.—*Ga-kaliso*, *Ga-piao* ("Frequenter of Reeds," or "Frequenter of Bamboos.") Not rare in the reedy *cienaga* near Agaña. Its specific name is very appropriate, as it has a song of exquisite sweetness.

Aplonis kittlitzii Finsch and Hartlaub. STARLING.

Local names.—*Sáli*, *Sále* (Chamorro); *Tordo* (Spanish). This bird looks very much like the European black thrush. It is very common and usually builds its nest in the top of a dead coconut palm. Closely allied to the Samoan *Miti-uli* (*A. brevirostris*).

Corvus kubaryi Reichenow. KUBARY'S CROW.

Local names.—*Aga* (Chamorro); *Cuervo* (Spanish). This bird is solitary in its habits. It is fond of the kernels of *Terminalia* nuts, and does much damage to the maize crops of the natives.

Myzomela rubrata (Less.). RED-AND-BLACK HONEY-EATER.

Local name.—*Egigi*. A pretty little bird; frequents the blossom of the coconut, banana, and scarlet hibiscus. The males often fight on the wing. Common and familiar near habitations.

Zosterops conspicillata Gray. WHITE-FRONTED ZOSTEROPS.

Local name.—*Nóssak*. Pretty little olive-green birds, yellow below; usually seen in flocks. They seemed to frequent a species of tall labiate

especially, feeding on insects, and clinging to the lower side of branches like a titmouse.

In addition to the birds mentioned in the preceding list the following species have been collected in the Marianne Islands, but the natives of Guam did not recognize them from my description and were unable to give me vernacular names for them.

Larus vegae (Palmen). One specimen taken; probably accidental.

Hydrochelidon leucoptera (Temm.). Probably a rare visitor.

Diomedea nigripes, Aud. Probably accidental.

Puffinus tenebrosus Pelz. One specimen, in Paris Museum.

Puffinus obscurus (Gm.). One specimen, Paris Museum.

Phaethon candidus Temm. Resident northern islands of group.

Sula piscatrix Linn. Resident, island of Rota.

Fregata ariel Gould. Given in Mr. Seale's list.

Fuligula fuligula Linn. On migration, one specimen, Paris Museum.

Fulica atra Linn. Probably accidental. One, Tring Museum.

Tringa acuminata (Horsf.). On migration, Paris Museum.

Calidris arenaria Linn. On migration, Tring Museum.

Totanus hypoleucus Linn. On migration.

Totanus glareola Tenn. On migration, Paris Museum.

Gallus bankiva (Temm.). Introduced. Not now on the island of Guam.

Astur sharpei Oustalet. One specimen; locality doubtful.

Accipiter nisoides Blyth. Accidental.

Hartert doubts the occurrence of *Asio accipitrinus* (Pall.) as a resident of the Marianne Islands and mentions it in his list as "accidental" (Novitates Zoologicae Vol. V. 1898, p. 68). This owl is well known to the natives. It is not uncommon on the island of Tinian, and I was told that it occurred in the northern part of the island of Guam, but I saw no specimen of it. The natives describe it as a bird with big eyes and a face like that of a cat, and state that it catches lizards. They call it Mómo, Moñgmo, or Mõño, the latter name being assigned to it by Padre Aniceto Ibañez del Carmen, who lived for many years in the Mariannes. The Japanese collectors failed to secure a specimen of this bird, and Monsieur Alfred Marche was equally unsuccessful; but M. Marche after having spent two years in the group returned without a specimen of *Poliolimnas cinereus*, a bird collected both by Mr. Owston's men and by Mr. Seale; and he also failed to secure specimens of *Numenius cyanopus*, and *Gallinago megala*, both of which are frequent visitors to the group. Hartert also considers *Fregata aquila* var. *minor* as accidental in the Marianas. It, too, is a bird well known to the natives, one of whom brought me a fine specimen of an adult female killed at Tumhun, on the west coast of Guam, November 23, 1899.

MOULTING OR MOLTING.*

Moult or Molting is defined in the dictionaries, especially in the Century, as the act or process of shedding or casting any tegumentary structures, especially feathers. *Moult* is the old and still accepted form used by English authors, but by American lexicographers, preference is given to the form *molt*. The word is derived from the Latin *mutare*, to change, and the use of the term among ornithologists is more in consonance with the etymon than the definitions in the dictionaries. As generally used and understood by ornithologists now, it is extended to the change or renewal of plumage. Moulting, then includes not only the shedding of feathers (*ecdysis*) but the subsequent development of new feathers. To shed a feather is the act of a moment; it is but the loosening of a dead growth and its sudden loss. It is generally unnoticed, causes little or no trouble, may occur anywhere at any time, and its loss may be hastened by its owner. On the contrary the new growth requires time, is somewhat exhausting to the subject, and may greatly affect the appearance and health of the bird, which always, in some species, retires into seclusion while the important vital function is developing a new and often different or better growth. In its broad meaning, for which there is no other equivalent word in the language, we have (a) a cessation of feather growth, (b) the gradual loosening and loss, unequal on the body, and (c) a renewal of growth, partial or complete, and often as complex in its manifestations as the parts of the plumage are varied. Considering the many functional characteristics of the parts of a bird's plumage, the varied tastes and habits of the class, and the great necessity for as little interruption as possible to the food habits, (for owing to the blood heat, the active life and the rapid assimilation of food, a long dormancy is not possible,) we find a complexity of change which is very difficult to correlate with the causes which have brought about their diversification.

As a papilla may produce a theoretically continuous feather growth during the life of the bird, so the molt is an interruption of what would otherwise be a continuous feather without a shaft. But for the molt, feathers might grow continuously during life and greatly interfere with the movement of the bird by their length and abundance. By careful management, the Japanese have produced this result with fowls of a special breed, where the tail feathers grow to the inordinate length of over eight feet by skipping the molting periods.

The connection of the old and new feather growth from the same papilla is in two ways, (a) the tip of the new growth is continuous or practically so

*The paragraphs on moulting have been contributed by Mr. William Palmer of the Smithsonian Institution.

with the base of the shaft of the preceding, and (b) the growth caps of the new feather are continuous with the dead caps in the shaft of the older growth. Actually, the tip and shaft connection and the cap connection are rarely continuous, for the cessation of growth is usually long and the size and weight of the old growth forces its removal which the connections are too feeble to prevent. There are cases, nevertheless, where the connection is maintained for a time, as will be shown later.

The first growth of contour feathers is that known as downs, or more exactly *neossoptiles*. These are present, or partly grown, at the hatching of the bird, or are absent or nearly so. They do not remain long, for to-day they have no value on most birds, and but a temporary use on others, but are soon forced from the papillae by the next growth, the *mesoptile*, or, as it is generally known on many birds, especially the passerine, the nesting plumage. On nearly all birds where they now exist, (mostly the higher forms,) the rami of the neossoptiles have their bases, (for they have no rachis or shaft,) bound together by the remains of the sheath within which they were formed, as in all feathers, but a rupture of this sheath ring, (and it is naturally ruptured on most birds,) shows that each ramus of the neossoptile is continuous into each ramus of the mesoptile, or, in rare cases on parts of feathers, the connection is obsolete. There are exceptions as to the ostrich and the duck, where the neossoptile rami unite at their bases to form a shaft the base of which divides into the rami of the mesoptile. Between these growths molt occurs, the disconnection occurring at varying periods for different feathers of the body, at the weakest point, wherever that may be, either structurally or at the time. On some birds, however, either partially or entirely, the connection is stronger than friction can overcome, so that the neossoptile is lost, if it is lost before the mesoptile is shed, by wearing, either completely or by the loss of the weaker rami. In the totipalmate birds, the neossoptile has a flat generalized shaft which is persistent dermally until forced from the papilla by the growth of the mesoptile, which grows for some time before its weaker pregrowth is ousted. On the flight feathers, especially in the tropic birds, the ordinary process occurs, thus showing the greater phylogenetic development of those parts.

While the molt of the neossoptile is usually perfect, there are cases where the neossoptile remains attached to the mesoptile, the base of which is attached to the tip of the succeeding growth, the first *teleoptile*, but these are not readily found owing to abrasion of the feathers.

The connection between the shaft of the mesoptile and the tip of the teleoptile is rarely evident because of the greater specialization and longer life of these feathers and the longer molting period. Usually the mesoptile drops out and the tip of the teleoptile soon appears in its place, but sometimes the

dead mesoptile is carried on the tip of the growing teleoptile, as on the breast of a marsh wren or towhee. Here the teleoptile tip is forced into the soft inferior umbilicus of the mesoptile shaft which it expands and fills. Subsequent or other feather molt is ordinary; the old feather, after a period of use, becomes loosened and falls out; or, as often happens where the insertion in the skin is deep or strong, the new growth pushes its tip past the base of its predecessor and eventually forces its loss, though in rare cases the two may maintain themselves side by side for a considerable period.

MOLTING PERIODS.

At the close of the breeding season when the young are able to obtain their subsistence, it is the rule, apparently with few exceptions, that the parents immediately begin to change the old and usually very much worn plumage. This new plumage may be like the old in color or very different, it may be acquired quickly or may require a long time, comparatively. Sometimes the change occurs in migrating birds, before they leave their summer home, in other cases it begins when the migration is over. The young also undergo a fall change which is usually more complex than in the adults. The change may be partial or complete and may be like the summer plumage as in the male Black-throated Blue Warbler or very unlike the breeding plumage, as in the Black Poll Warbler where the adult also acquires a plumage very unlike the breeding one and which is renewed in the following spring on both. A young male Hooded Warbler molts the gray body mesoptiles within a few days after leaving the nest and acquires a new and strikingly different plumage, the first teleoptile, of bright yellow and black, but it retains the mesoptile flight feathers which as a migratory bird it carries to its (to us) winter home. Such is the character of the change on many of our passerine birds, the period of the uses of the mesoptile and first teleoptile featherings varying in different species.

But in some cases, as in the Cardinal, the change on the immature bird is complete, the entire mesoptile growth, very similar to the adult female plumage, giving way rapidly to the first teleoptile, similar to the adult plumage. In these last two species this highly colored adult plumage acquired in autumn is retained until the close of the next summer and is the breeding plumage of these males. In the Indigo, and Scarlet Tanager, however, the highly colored adult males molt in August into a greenish plumage which is again changed in spring for the richer coloration, while the young of the year assumes also the obscure fall plumage in which it winters and again changes in spring into the richer condition, but rather imperfectly, for the young indigo in its first spring has only an approach toward the full beauty of

the adult male. The young male tanager in the spring is less deeply colored than the older bird, and while the rectrices are changed at the spring molt the primaries are retained until the fall molt. In these birds, and indeed in many other cases, there is little or no spring change in the females, simply wear. A familiar case is the Bobolink. Here the adults and young in the fall all assume the Reed Bird plumage. Then early in our spring at their winter home in southern South America the males molt into the familiar black plumage with yellowish trimmings which as the summer advances wear into the sharply contrasted black and whitish breeding condition.

Another interesting case is that of the Redstart where the young male instead of changing in spring into the full plumage of the adult assumes a spotted condition in its color values half male and half female, only here and there acquiring a few black feathers, a result which is so irregular that hardly two specimens are alike. In other cases but a slight change is made in the spring, usually on the males only and more often perhaps where there is some prominent coloration of the head as in the Maryland Yellowthroat and the White-throated Sparrow. Again in other cases as in the Snow Bunting there is no spring molt but the breeding plumage condition is attained by the wearing away of the weaker colored tips of the feathers so that there is a stronger and sharper contrast of color and markings. Analogous cases occur in other groups as in the water birds, but peculiar conditions also occur, a few only of which can be given here. An adult Cormorant molting in the late summer acquires a suit of richly glossy feathers with many white ones of a different kind decorating the neck, these dropping out in the early spring thus constituting a winter decoration. On the contrary the immature birds acquire the brown mesoptile plumage soon after leaving the nest, retain it until the middle or latter part of the following summer when they acquire the adult condition, or nearly so. The young male Summer Duck changes its neosoptile feathers, in which it was hatched, while quite small, for a mesoptile plumage very similar to that of the female and then late in summer acquires the rich plumage of the old bird. The adult males, as far as known, change from one rich plumage to another.

In the Eider Duck a different change occurs. After the breeding season the males lose the strong distinctive coloration and assume a plumage very much like that of the females but with many of the feathers still retaining large areas of white. A month or so later another change takes place; the brown feathering is entirely replaced and the bird appears in its full distinctive plumage in which it breeds, plus wearing, in the following summer. For the first change these Eiders retire to the marshes and at the same time loose their flight feathers like many other ducks, all at once. The brown plumage is therefore of value for it serves to hide its wearer in the marsh vegetation during a criti-

cal period while it is assuming a new suit of flight feathers. It would seem probable that in cases like these where we have a different plumage, evidently ancestral because like the female, and worn for a short time after the breeding season; and also like the fall plumages of the Bobolink, Indigo, and Black Poll Warbler where the same plumage is worn for several months and eventually replaced by a better, we may have instances of the retaining of the older style of plumage of the males for a lesser or longer period according to various influences. The tendency among birds seems to be, especially among the more boreal, to change after the breeding season as quickly as possible and to ignore any spring molting change.

INDIVIDUAL MOLT.

As the principal use of feathers is to conserve the body heat, it follows that when a bird is ready to molt, all the feathers cannot be advantageously shed and replaced at once. Consequently there has developed a definite sequence of change which is best suited to the habits and economy, and which is slightly or greatly different in the various groups, though ordinarily a general similarity is noticeable. Thus, while many ducks can lose all their flight feathers at once, and as a result change their habits for a period, all birds cannot do so just as all ducks do not. This subject cannot be discussed in any great detail here for it is too vast, but a few examples will suffice to show the character of the changes and to some extent their correlation.

The first sign of a molt, (and this is more generally true of young birds,) is on the breast where the feathers along the sides are usually rapidly replaced. At the same time, or a few days later, pin feathers will be noticed among the old feathers of the back so that usually the body feathers are the first to complete the molt. While this is going on the head feathers will begin to change, so that we find the molt growing as it were from the body toward the head and from the head downwards. In the ducks and rails, and in some other cases probably, the flight feathers are shed first, the body change following immediately, but in many cases the change may go on at once variously over the whole body, except that some parts, such as about the bill, the thighs, the wing and tail coverts, may be the last to perfect the new growth. As the tail in ordinary cases is of little use, it is often dropped at once, though occasionally a few feathers may persist for a time, but, as in the Turkey Vulture the tail is an important flight organ, we find that its feathers as well as those of the wing, as on other species of similar flight habits, are gradually and often irregularly replaced so as not to interfere with the necessary constant use of the organ. A peculiar instance of this obtains in the woodpeckers where the central pair of old feathers are retained until the lateral new ones are functionally serviceable.

In most species of birds, it would simply be inviting disaster from their enemies if the wing feathers were shed at once, as in certain ducks and geese, consequently we find that the molting change in the large feathers begins with the inner primaries and the adjoining secondaries. Usually alternate feathers are renewed and almost fully grown before adjoining feathers are dropped and usually also the secondaries are entirely renewed before the primaries, the decorative tertials as in all decorative feathers changing last. In this way no gaps occur, or at least gaps are reduced to a minimum. When these flight feathers are serviceable, the smaller wing feathers are changed and also the outer primaries. It often occurs on specimens that the flight feathers of the wing are new except the three or four outer primaries which are still of the old growth. To this fact is due another, which is an interesting phase of feather growth correlated with the economy of species, for in species of good power of flight requiring great wing power to escape enemies, as in most of the waders and in migrants performing long journeys, especially over seas, we find that the outer primaries are long; while in sedentary species, especially of woodland types, and tropical species, the wing is rounded and the outer primaries are short. Thus the character of the outer primary growth especially is determined by the strain on the wing, the character of the flight.

It often happens that from some cause the molt is retarded or even entirely stopped so that we find feathers of the old winter dress mixed with new ones of the breeding plumage. Rarely also a few feathers of an earlier change are also retained. The molt is nearly always more complete on the older males because of the greater sexual feather values.

COLOR CHANGE WITHOUT MOLT.

Until within a few years past it was not the custom of ornithologists to preserve molting specimens of birds or to take any active interest in the subject of molt. In the absence of series of specimens illustrating the sequence of molting changes, and especially with many so-called intermediate specimens showing evidently a possible series of changes with no traces of molt, it became the custom of many to accept unreservedly for some or all species, the belief that a full grown and therefore dead feather could at a certain time rejuvenate itself and acquire a fresh growth and color, even acquiring a stronger and much richer coloration than the full color of its species.

As, however, the matter has been more fully studied and larger and more varied collections obtained, it has been gradually shown that in all the cases brought forward to show so-called color changes of feathers, molting had actually occurred and was the responsible agent. Age and sex are important in determining the extent and strength of molting change on a bird, and when

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